

BAYOU BOEUF TMDL FOR TOTAL DISSOLVED SOLIDS (TDS)

SUBSEGMENT 060208

US EPA Region 6

Final

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the waterbody. A TMDL has been developed total dissolved solids (TDS) for Bayou Boeuf.

Bayou Boeuf flows in a generally southerly direction, to a confluence with Bayou Cocodrie, forming the headwaters of Bayou Courtableau. Bayou Boeuf segment 060208 was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not fully supporting the water quality standard for propagation of fish and wildlife and was ranked as high priority for TMDL development. Louisiana's water quality standards for chloride, sulfate, and TDS is applied as follows:

“Numerical criteria for these parameters generally represent the arithmetic mean of existing data from the nearest sampling location plus three standard deviations. For estuarine and coastal marine waters subsegments in Table 3 that have no listed criteria (i.e., designated N/A), criteria will be established on a case-by-case basis using field determination of ambient conditions and the designated uses. For water bodies not specifically listed in the Numerical Criteria and Designated Table, increases over background levels of chloride, sulfate, and TDS may be permitted. Such increases will be permitted at the discretion of the office on a case-by-case basis and shall not cause in-stream concentrations to exceed 250, 259, and 500 mg/l for chloride, sulfate, and TDS, respectively, except where a use attainability analysis indicates that higher levels will not affect the designated uses. In permitting such increases, the office shall consider their potential effects on resident biota and downstream water bodies in addition to the background conditions. Under no circumstances shall an allowed increase over background conditions cause any numerical criteria to be exceeded in any listed water body or any other general or numerical criteria to be exceeded in either listed or unlisted water bodies.”

Five years (January, 1994 – December 1998) of monthly LDEQ monitoring data on Bayou Boeuf (WQ site 104) were assessed to determine if the propagation of fish and wildlife uses were being maintained. Analysis of the data shows that the propagation of fish and wildlife use is not protected. Therefore, a TMDL was developed to protect the propagation of fish and wildlife.

For the purpose of TMDL development, the criterion of 100 mg/l was applied. The TDS TMDL was developed based on simple dilution calculations using average flow and the state TDS criterion of 100 mg/l for this subsegment. The TMDL calculation includes wasteload allocations, load allocations, and a margin of safety. A 39.5% reduction in TDS loading will be needed to meet the standard for the propagation of fish and wildlife.

1. Introduction

Bayou Boeuf, subsegment 060208, was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not fully supporting the water quality standard for the propagation of fish and wildlife. Subsegment 060208 was ranked as high priority (ranking of 1) on the 1998 List. A TMDL for total dissolved solids (TDS) was developed in accordance with the requirements of Section 303 of the federal Clean Water Act. The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant; the TMDL also establishes the load reduction that is necessary to meet the standard in a waterbody. The TMDL consists of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The wasteload allocation is the load allocated to point sources of the pollutant of concern, and the load allocation is the load allocated to nonpoint sources. The margin of safety is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions and data inadequacies.

2. Study Area Description

2.1 Bayou Boeuf, Subsegment 060208

Bayou Boeuf is located within segment 0602 in south central Louisiana. Bayou Boeuf flows in a generally southerly direction, to a confluence with Bayou Cocodrie, forming the headwaters of Bayou Courtableau. Most of the area of the Bayou Boeuf watershed lies within the natural flood plain of the Red River. The Red River is now leveed, eliminating the potential for a natural flow of water from the River into any of the streams in Segment 0602.

Land use is predominately forest and agriculture with the Alexandria urban area located to the north. Suburban communities have developed in the agricultural lands immediately south and west of Alexandria. The major land uses are listed in Table 1.

Table 1. Land Use (acres) in Segment 0602: Vermilion-Teche Basin

SEGMENT	AGRICULTURE	URBAN	WETLAND	FOREST
0602	6,464 (40.4%)	589 (3.7%)	2,638 (16.5%)	5,499 (34.4%)

2.2 Water Quality Standards

The designated uses for Bayou Boeuf include the propagation of fish and wildlife. TDS serve as the indicator for the water quality criteria and for assessment of use support. Louisiana's water quality criterion for TDS in subsegment 060208 is 100 mg/l.

2.3 Identification of Sources

The sources identified in the *1998 Louisiana Water Quality Inventory* as affecting the water quality of Bayou Boeuf are designated as "Other" (natural sources) (LDEQ 1998).

2.3.1 Point Sources

There are 30 permitted facilities (with known flow information) discharging sanitary wastewater into Bayou Boeuf and its tributaries. The combined flow of all these discharges is 974,370 gallons per day (see Table 2).

Table 2. List of Dischargers and Wasteload Allocations

Dischargers to Bayou Boeuf				
Facility	Permit #	Receiving Water	Discharge Flow gallons/day	Wasteload lb/day
KOA Campground		Bayou Boeuf	11,000	9.174
Tunk's Cypress Inn		Bayou Boeuf	11,000	9.174
Oak Shawdow Subdivision	LA0062391	Bayou Boeuf	5,000	4.17
Woodlands Subdivision	LA0069639	Bayou Boeuf	17,000	14.178
Cloverdale Subdivision	LA0039021	Bayou Boeuf	140,000	116.76
Gerard Glen Apartments		Bayou Boeuf	6,000	5.004
Gary Glen Apartments		Bayou Boeuf	7,000	5.838
Lynnwood Acres Subdivision	LA0072559	Bayou Boeuf	16,000	13.344
Timberlake VI Subdivision		Bayou Boeuf	19,000	15.846
Timberlake Subdivision	LA0056654	Bayou Boeuf	60,000	50.04
Grundy Cooper Subdivision	LA0039012	Bayou Boeuf	135,000	112.59
Lebanon Subdivision	LA0038997	Bayou Boeuf	36,000	30.024
Twin Bridges Mobile Home Park	LA0069698	Turkey Bayou to Bayou Boeuf	24,000	20.016
Bayou Oaks Estates	LA0071404	Bayou Boeuf	24,000	20.016
Penny Acres Subdivision	LA0038989	Bayou Boeuf	38,000	31.692
Westgate Village Subdivision		Bayou Boeuf	11,000	9.174
Brookwood Subdivision		Bayou Boeuf	66,000	55.044
Spring Creek Apartments		Bayou Boeuf	4,000	3.336
Methodist Conference Center		Bayou Boeuf	87,000	72.558
Willow Creek Apartments		Bayou Boeuf	0	0
Deerfield Subdivision	LA0072541	Bayou Boeuf	0	0
Valentinel Rec. Area	LA0040983	Bayou Boeuf	21,000	17.514
Town of Cheneyville	LA0059927	Bayou Boeuf	15,000	12.51
White Development Company	LA0083666	Bayou Boeuf	0	0
Springdale Westgate Sewer Dist	LA0083763	Bayou Boeuf	0	0
Diamond "B" Construction Co.	LA0086355	Bayou Boeuf	300	0.2502
Waste Management Control	LA0095842	Bayou Boeuf	250	0.2085
Martco Partnership	LA0062651	Bayou Wauksha	820	0.68388
Wodlands	LA0081035	Bayou Boeuf	200,000	166.8
McKeithon Mobile Home Park	LA0071544	Bayou Boeuf	20,000	16.68
		Total	974,370	812.6246

2.3.2 Nonpoint Sources

The predominant land uses along the Bayou Boeuf are agriculture and forestry. It is unknown to what extent each of these land uses contributes to TDS loads through runoff.

3. TMDL Load Calculations

3.1 Current Load Evaluation

TDS loads have been calculated using the instream TDS concentration and the flow of the stream. The following equation can be used to calculate TDS loads.

$$\text{Equation 1. } C \times Q \text{ in cfs} \times 5.39 \text{ lb/day or } C \times Q \text{ in MGD} \times 8.34 \text{ lb/day}$$

Where: C = concentration in mg/l

Q = stream flow in cfs or MGD

A traditional expression of the loading may be developed by setting one critical or representative flow and concentration, and calculating the TDS load using Equation 1. The difficulty with this approach is in the determination of the appropriate flow or concentration value to use.

For the purpose of calculating current loading on this waterbody the average TDS concentration was calculated using monthly LDEQ monitoring data on Bayou Boeuf (WQ site 104). WQ site 104 was used because of its multiple years of TDS data. In Bayou Boeuf, the monthly TDS concentrations ranged from 78 mg/l to 332 mg/l over a 5-year period (January, 1994-December, 1998) (see <http://www.deq.state.la.us/surveillance/wqdata/0104wqng.txt> for data). The average TDS concentration is 165.3 mg/l. In addition, the average flow for Bayou Boeuf is 312 ft³/sec (see Appendix A). Using these values and Equation 1 it is estimated that the current loading is 277,982 lb/day.

3.2 TMDL

Point sources usually have a defined critical receiving stream low flow such as the 7Q10 (or Harmonic mean flow) at which the criterion must be met. For nonpoint sources it is recognized that there may be no single critical flow condition. The load reduction needed to meet the water quality standard for propagation of fish and wildlife in Bayou Boeuf at 312 cfs is 109,814 lb/day (39.5% reduction). This was obtained by calculating the allowable TMDL at 312 cfs for the 100 mg/l criterion (168,168 lb/day) and subtracting this load from the observed load (277,982 lb/day).

Current Load - TMDL = Load Reduction

$$277,982 \text{ lb/day} - 168,168 \text{ lb/day} = 109,814 \text{ lb/day}$$

3.3 Wasteload Allocation (WLA)

The Louisiana Water Quality Regulations require permitted point source discharges of treated sanitary wastewater to maintain in-stream TDS water quality standards of 100 mg/l on this

subsegment. Therefore, there will be a need to include TDS limits in the permit requirements based upon a wasteload allocation resulting from this TMDL.

Equation 1 can be used to calculate the total point source load (wasteload allocation) utilizing TDS concentration of 100 mg/l and the total volume of all the wastewater dischargers (974,370 gallons/day).

$$100 \text{ mg/l} * Q \text{ in MGD} * 8.34 = \text{WLA}$$

Where Q = Total volume of sanitary wastewater discharges into Bayou Boeuf

$$\text{WLA for all dischargers} = 813 \text{ lb/day}$$

WLAs for individual dischargers are found in Table 2.

3.4 Load Allocation (LA)

The load allocation for a given flow can be calculated using Equation 1 and the following relationship:

$$(\text{TMDL@ given flow and criterion}) - (\text{WLA}) = \text{LA}$$

$$\text{LA at an instream flow of 312 cfs} = 167,355 \text{ lb/day}$$

$$168,168 \text{ lb/day (TMDL@ 312 cfs)} - 813 \text{ lb/day (WLA)} = 167,355 \text{ lb/day}$$

3.5 Seasonal Variability

Louisiana's water quality standards for TDS apply January through December. Therefore, no seasonal TMDL for TDS were developed.

3.6 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration a margin of safety. EPA guidance allows for the use of implicit or explicit expressions of the margin of safety or both. When conservative assumptions are used in the development of the TMDL or conservative factors are used in the calculations, the margin of safety is implicit. When a percentage of the load is factored into the TMDL calculation as a margin of safety, the margin of safety is explicit. In this TMDL for TDS, conservative assumptions have been used and therefore, the margin of safety is implicit. These conservative assumptions are:

- Using average flows to calculate current loading to obtain load reduction.
- Treating TDS as a conservative pollutant, that is, a pollutant that does not degrade in the environment.
- Using the design flow of the point source dischargers rather than actual average flow rates, which are typically much lower

4. Other Relevant Information

Although not required by this TMDL, LDEQ utilizes funds under Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act to operate an established program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been established by the time the first priority basins are monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following establishment of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Vermilion-Teche River Basin will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins
1999 - Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to 1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

5. Public Participation

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comment concerning the TMDL. Pursuant to an October 1, 1999, Court Order, EPA prepared this TMDL. After submission of this TMDL to the Court, EPA commenced preparation of a notice seeking comments, information and data from the general and affected public. Comments and additional information were submitted during the public comment period and this Court Ordered TMDL was revised accordingly. EPA has transmitted this revised TMDL to the Court, and to the Louisiana Department of Environmental Quality (LDEQ) for incorporation into LDEQ's current water quality management plan.

REFERENCES

- LDEQ Ambient Water Quality Database (<http://www.deq.state.la.us/surveillance/wqdata/0104wqng.txt>)
- LDEQ ,1998. *State of Louisiana Water Quality Management Plan, Volume 5, Part B: Water Quality Inventory*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, LA.

APPENDIX A. Flow Information

DETERMINATIONS OF AVERAGE STREAMFLOW FOR SELECTED LADEQ WATER QUALITY STATIONS IN LOUISIANA.

Note: *The* "average streamflow" is defined to be the annual average streamflow.

Bayou Boeuf at mouth (DEQ 668) - Based on the runoff for the USGS station at Bayou Courtableau near Washington, 1.56 CPS per square mile, and a drainage area for the 668 site of 234.33 square miles, the average streamflow is estimated to be 312 CFS. The May - October average flow is estimated to be about 53% of the annual average flow; the November - April average flow is estimated to be about 147% of the annual average flow.